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WEATHER BUREAU
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MONTHLY WEATHER REVIEW

JAMES E. CASKEY, JR., Editor

Volume 84
Number 6

JUNE 1956

Closed August 15, 1956
Issued September 15, 1956

FREQUENCIES OF SELECTED LOW TEMPERATURES IN ALASKA*

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[Manuscript received March 31, 1955; revised June 4, 1956]

ABSTRACT

This report presents in detail the frequency of selected low temperatures at 33 stations in Alaska. Daily maximum temperatures at or below 0° F. may be expected over 50 percent of the days in January at interior stations and extreme northern coastal stations, but do not occur at stations exposed to the moderating influence of the ocean. The greatest frequency of maximum temperatures at or below −40° F. occurs at Umiat, where 15 percent of the days in January record this value. Minimum temperatures of −65° F. or less are recorded at only four of the interior stations.

During July, maximum temperatures at or below 68° F. occur least frequently at interior stations (13 percent of the days at Fort Yukon, 31 percent of the days at Fairbanks) and 75 to 100 percent of the time at stations exposed to maritime influence. Daily minimum temperatures at or below 32° F. in July are rare at all stations south of the Brooks Range. On the Arctic coast, in July, Barter Island and Barrow have freezing temperatures 39 and 41 percent of the time, respectively.

1. INTRODUCTION

Alaska occupies the northwestern part of North America, with the greatest portion between 60° and 70° N. latitude and 140° and 165° W. longitude (fig. 1). In addition, there are the Alaska Peninsula and the Panhandle, which extends southeastward along the Pacific coast in a strip approximately 125 miles wide. This study excludes the Aleutian Chain since extreme cold is not experienced there.

Coastal plains, river valleys, and flood plains, with elevations usually under 1,000 feet, extend over approximately one-half the area. The remainder of the region is composed of rugged mountains: the Brooks Range in the north with peaks of nearly 10,000 feet and the Alaska and Chugach Mountains in the south with several peaks reaching elevations of 15,000 to 20,000 feet.

Temperatures in Alaska are influenced by both mari-

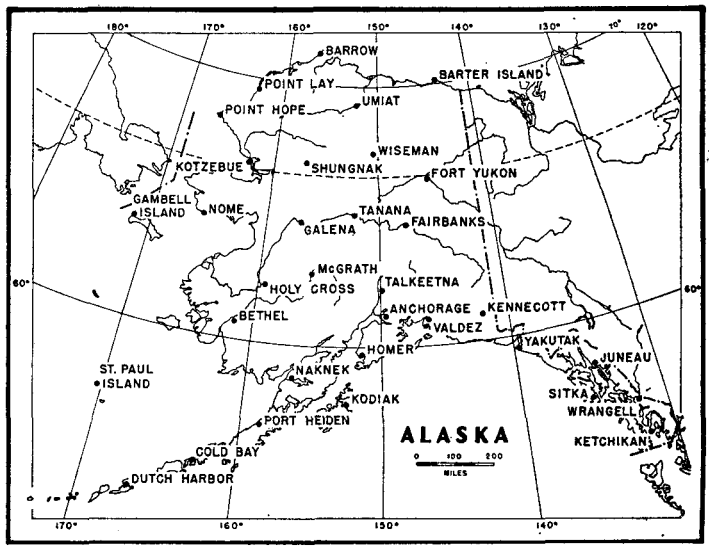

FIGURE 1.—Station location map.

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TABLE 1.—*Mean temperatures (° F.) for selected stations in Alaska*

Station	Length of record (yrs.)	Temperature	January	July	Station	Length of record (yrs.)	January	July	Station	Length of record (yrs.)	January	July
Anchorage	23–26	Mean	11.9	57.0	Homer	8–12	23.1	54.6	Port Heiden	1– 2	29.0	52.0
	22–25	Mean max.	19.2	65.1		7–11	29.9	63.6		1– 2	34.0	57.0
	23–25	Mean min.	4.6	48.9		7–11	16.1	46.0		1– 2	34.0	46.0
Barrow	26–31	Mean	−16.7	40.0	Juneau	44–48	27.8	56.7	St. Paul Island	29–32	24.8	45.9
	25–29	Mean max.	−10.5	46.7		44–48	31.8	63.7		24–27	28.5	49.6
	25–28	Mean min.	−23.3	33.7		43–47	24.4	50.0		24–27	21.3	42.1
Barter Island	3– 4	Mean	−15.2	39.1	Kennicott	26–29	4.8	52.4	Shungnak	6– 8	1.8	58.4
	3– 4	Mean max.	−7.6	43.2		24–25	12.8	64.7		6– 8	5.9	68.6
	3– 4	Mean min.	−22.7	34.8		25	−3.2	40.4		6– 8	−9.5	48.4
Bethel	17–19	Mean	6.7	54.3	Ketchikan	30–31	33.3	57.6	Sitka	58–60	32.6	55.0
	16–18	Mean max.	15.8	62.8		23–24	39.1	65.2		44–47	38.1	61.3
	17–18	Mean min.	−0.7	46.0		23–24	29.7	50.1		44–47	26.9	48.5
Cold Bay	4	Mean	28.0	49.0	Kodiak	36–47	30.1	54.3	Talkeetna	21–24	8.3	57.9
	4	Mean max.	32.0	54.0		20–22	35.0	60.4		20–23	18.5	70.1
	4	Mean min.	24.0	45.0		20–22	25.8	47.5		20–23	−2.9	45.7
Dutch Harbor	24–26	Mean	31.9	51.3	Kotzebue	12–19	−9.6	52.5	Tanana	34–41	−12.1	58.4
	22–24	Mean max.	36.7	57.5		8–12	−1.0	57.7		33–38	−4.0	70.5
	22–24	Mean min.	27.8	45.0		8–11	−14.1	46.3		34–40	−20.9	46.2
Fairbanks	36–38	Mean	−11.3	60.0	McGrath	10	−6.7	58.7	Umiat	4– 6	−21.6	53.5
	11	Mean max.	−1.7	70.7		10	3.3	68.2		4– 6	−12.4	63.8
	11	Mean min.	−20.6	48.4		10	−16.6	49.2		4– 6	−30.8	43.1
Fort Yukon	21–27	Mean	−20.8	61.4	Naknek	13–19	14.5	54.9	Valdez	26–31	19.2	53.3
	19–21	Mean max.	−10.9	72.2		12–18	21.9	63.2		22–28	26.1	60.2
	19–21	Mean min.	−27.4	50.5		13–19	7.7	47.0		21–28	12.5	45.4
Galena	4	Mean	−9.5	59.5	Nome	34–36	3.4	49.9	Wiseman	7– 8	−11.4	55.9
	4	Mean max.	−1.2	67.1		33–35	10.6	56.0		6– 7	−2.1	67.3
	4	Mean min.	−17.7	51.8		34–35	−3.7	43.9		6– 8	−21.0	45.2
Gambell Island	4– 8	Mean	1.1	46.4	Point Hope	7– 8	−3.1	44.3	Wrangell	25–27	29.4	58.1
	2– 6	Mean max.	3.0	54.3		6– 8	4.6	50.0		17–21	35.7	66.0
	2– 6	Mean min.	−6.7	42.7		6– 8	−10.7	41.2		17–21	25.2	49.1
Holy Cross	35–44	Mean	−0.5	56.6	Point Lay	9–11	−13.3	45.9	Yakutat	18–22	29.5	52.9
	21–23	Mean max.	10.0	67.0		8–10	−5.5	53.0		17–21	34.2	58.3
	21–23	Mean min.	−5.1	47.8		8–10	−21.1	37.7		17–21	25.4	47.7

TABLE 2.—*Frequency (percent) of daily maximum and daily minimum temperatures (°F.) at or below specified values for selected stations in Alaska in January*

Station	Length of record (Yrs)	Daily maximum at or below—								Daily minimum at or below—							
		68	50	32	23	14	0	−25	−40	50	32	23	14	0	−25	−40	−65
Anchorage	23	100	100	80	54	31	6	0	0	100	99	89	66	33	3	0	0
Barrow	21	100	100	100	95	90	74	14	1	100	100	100	100	92	43	7	0
Barter Island	4	100	100	100	93	85	69	20	2	100	100	100	99	92	44	14	0
Bethel	23	100	100	79	63	52	29	4	0	100	98	88	77	54	17	3	0
Cold Bay	2	100	100	35	15	0	0	0	0	100	79	37	16	0	0	0	0
Dutch Harbor	15	100	98	23	6	0	0	0	0	100	65	21	3	0	0	0	0
Fairbanks	23	*100*	*100*	*95*	*89*	*80*	*51*	*14*	6	100	100	99	99	87	38	16	1
Fort Yukon	20	100	100	98	95	90	68	20	9	100	100	100	100	91	51	26	2
Galena	8	100	100	99	97	77	46	20	10	100	100	100	100	77	43	24	0
Gambell Island	15	100	100	97	86	70	30	0	0	100	100	96	86	58	0	0	0
Holy Cross	22	100	100	91	76	58	33	4	1	100	99	95	72	59	20	7	0
Homer	18	*100*	*100*	*53*	25	13	2	0	0	100	92	68	42	18	0	0	0
Juneau	23	100	99	45	22	6	1	0	0	100	77	43	22	7	0	0	0
Kennicott	18	100	100	82	65	47	28	1	0	100	100	93	83	58	11	1	0
Ketchikan	23	100	96	16	66	2	0	0	0	100	50	20	9	1	0	0	0
Kodiak	21	100	100	24	10	3	0	0	0	100	68	30	12	2	0	0	0
Kotzebue	20	100	100	99	86	71	46	11	1	100	100	99	94	76	30	5	0
McGrath	11	*100*	*99*	*96*	88	76	42	12	5	100	100	100	95	78	37	20	0
Naknek	20	100	100	64	48	33	17	0	0	100	93	77	63	38	6	0	0
Nome	23	100	100	93	68	49	25	1	0	100	99	88	75	52	12	0	0
Point Hope	7	100	100	100	82	70	45	1	0	100	100	100	95	81	27	0	0
Point Lay	7	100	100	99	89	82	67	13	0	100	100	100	96	90	48	13	0
Port Heiden	4	100	100	*54*	*23*	*18*	*3*	*0*	0	*100*	*89*	*69*	*40*	*10*	0	0	0
St. Paul Island	19	100	100	49	21	9	0	0	0	100	85	47	25	3	0	0	0
Shungnak	8	100	100	96	77	67	33	12	6	100	100	97	90	64	28	17	0
Sitka	23	100	98	18	4	1	0	0	0	100	66	25	11	1	0	0	0
Talkeetna	21	*100*	*100*	86	60	36	8	1	0	100	100	93	74	55	13	2	0
Tanana	20	100	100	100	96	86	53	13	5	100	100	99	98	84	37	19	1
Umiat	6	100	100	100	90	78	67	39	15	*100*	100	*100*	98	92	65	33	0
Valdez	21	100	100	72	34	10	1	0	0	100	100	84	59	19	0	0	0
Wiseman	16	100	100	100	90	78	44	8	2	100	100	100	99	85	33	11	1
Wrangell	23	100	97	33	11	2	0	0	0	100	74	39	21	2	0	0	0
Yakutat	17	100	100	41	11	2	0	0	0	100	87	48	27	12	0	0	0

TABLE 3.—*Frequency (percent) of daily maximum and daily minimum temperatures (°F.) at or below specified values for selected stations in Alaska in July*

Station	Length of record (yrs.)	Daily maximum at or below—				Daily minimum at or below—			
		68	50	32	23	50	32	23	14
Anchorage	21	75	0	0	0	67	0	0	0
Barrow	20	93	63	1	0	100	41	1	0
Barter Island	3	100	82	1	0	100	39	0	0
Bethel	21	80	2	0	0	86	1	0	0
Cold Bay	2	100	39	0	0	100	0	0	0
Dutch Harbor	14	100	4	0	0	94	0	0	0
Fairbanks	20	31	1	0	0	63	0	0	0
Fort Yukon	18	13	0	0	0	46	1	0	0
Galena	7	51	0	0	0	29	0	0	0
Gambell Island	14	100	67	0	0	100	1	0	0
Holy Cross	22	57	1	0	0	71	1	0	0
Homer	16	95	1	0	0	93	0	0	0
Juneau	22	79	1	0	0	65	0	0	0
Kennicott	18	68	1	0	0	100	1	0	0
Ketchikan	22	73	0	0	0	41	0	0	0
Kodiak	21	93	3	0	0	83	0	0	0
Kotzebue	18	91	14	0	0	74	1	0	0
McGrath	11	53	1	0	0	58	0	0	0
Naknek	18	84	1	0	0	87	0	0	0
Nome	22	99	27	0	0	93	1	0	0
Point Hope	8	100	54	0	0	97	8	0	0
Point Lay	3	96	38	0	0	99	10	0	0
Port Heiden	3	96	14	0	0	99	1	0	0
St. Paul Island	18	100	66	0	0	100	0	0	0
Shungnak	8	50	2	0	0	61	0	0	0
Sitka	22	98	1	0	0	64	0	0	0
Talkeetna	21	47	0	0	0	81	1	0	0
Tanana	20	40	0	0	0	70	2	0	0
Umiat	5	65	9	0	0	90	5	0	0
Valdez	19	92	1	0	0	99	0	0	0
Wiseman	15	48	1	0	0	83	1	0	0
Wrangell	21	77	0	0	0	58	0	0	0
Yakutat	18	98	1	0	0	81	0	0	0

time and continental conditions. Generally, interior valleys are the coldest areas during winter. Summers are warmest in the extreme southeastern coastal districts and in the Yukon valley. The long period of daily sunshine in summer is partly responsible for high summer temperatures, and conversely, the long periods of darkness and relatively little cloudiness in many areas during winter favor the occurrence of low temperatures.

The southern coast, on the Gulf of Alaska, is ice-free all winter and temperatures are mild compared with those farther north. During winter, along the coast from the Bering Sea to the Beaufort Sea, frozen seas result in a practically continental surface cover over an extensive area. Nevertheless, temperatures at ice-bound coastal stations do not reach the low extremes of the interior because of the heating influence of the water beneath the ice cover. In addition, greater advection near the coast prevents stagnation of air and the formation of cold pockets, and the somewhat higher vapor content of the air reduces the net loss of terrestrial radiation.

2. DATA

Data used in the preparation of this paper were obtained from publications of the U. S. Weather Bureau [1], U. S. Air Force [2] and U. S. Navy [3]. Stations were selected to provide adequate coverage of the area together with a reliable period of record. In some instances, particularly along the Arctic coast where data are scarce, it was necessary to use stations having short periods of record. The majority of stations, however, have records of over 15 years in length. Since data for some months are missing, lengths of records are provided in each of the tables presenting climatic data.

TABLE 4.—*Annual frequency of daily maximum and daily minimum temperatures (°F) at or below specified values for selected stations in Alaska*

Station	Length of record (yrs.)	Daily maximum at or below—								Daily minimum at or below—							
		68	50	32	23	14	0	−25	−40	50	32	23	14	0	−25	−40	−65
Anchorage	21–23	95	59	30	17	7	1	0	0	94	57	38	25	10	1	0	0
Barrow	19–22	99	95	72	57	46	31	3	1	100	89	68	59	46	13	2	0
Barter Island	3–4	100	97	73	58	46	32	7	1	100	87	69	60	40	20	4	0
Bethel	21–23	96	67	37	25	18	8	1	0	97	62	44	33	20	3	1	0
Cold Bay	1–3	100	82	14	3	1	0	0	0	99	42	13	3	1	0	0	0
Dutch Harbor	12–15	99	70	8	1	0	0	0	0	97	34	8	1	0	0	0	0
Fairbanks	20–23	86	61	43	35	27	14	3	1	94	65	52	45	33	11	4	1
Fort Yukon	17–20	87	68	54	44	35	22	6	2	92	68	59	51	40	17	8	1
Galena	6–8	93	67	48	37	27	14	3	1	90	63	54	54	31	13	5	0
Gambell Island	11–15	100	87	54	32	24	9	0	0	100	70	49	36	20	1	0	0
Holy Cross	20–23	92	64	39	28	19	8	1	1	95	61	46	34	21	4	1	0
Homer	15–18	99	63	19	7	3	1	0	0	98	53	28	15	4	0	0	0
Juneau	21–23	94	57	13	10	2	1	0	0	93	33	13	6	2	0	0	0
Kennicott	16–18	93	62	32	22	14	6	1	0	100	64	44	33	19	3	1	0
Ketchikan	20–23	92	47	4	1	1	0	0	0	84	20	5	2	1	0	0	0
Kodiak	19–22	98	65	8	2	1	0	0	0	95	34	11	3	1	0	0	0
Kotzebue	17–21	99	82	56	43	30	15	2	1	96	70	56	48	32	9	1	0
McGrath	10–11	91	63	43	33	25	12	2	1	95	63	52	42	30	11	4	0
Naknek	16–22	97	62	27	17	10	4	0	0	97	56	35	25	13	1	0	0
Nome	20–23	99	78	47	30	19	6	1	0	99	67	50	37	21	3	1	0
Point Hope	5–8	100	92	59	44	33	16	1	0	100	75	61	50	36	6	1	0
Point Lay	3–10	100	94	74	60	48	33	3	1	100	86	76	67	51	20	3	0
Port Heiden	2–5	99	78	28	11	5	1	0	0	99	59	33	18	6	0	0	0
St. Paul Island	17–20	100	89	21	7	3	1	0	0	100	50	19	9	1	0	0	0
Shungnak	6–8	92	71	51	37	27	14	3	1	94	69	56	45	29	14	5	0
Sitka	20–23	99	52	4	1	1	0	0	0	91	30	8	3	1	0	0	0
Talkeetna	18–21	88	58	31	17	8	2	1	0	87	63	43	30	17	3	1	0
Tanana	18–22	89	64	47	38	29	14	3	1	96	68	54	46	33	11	5	1
Umiat	4–6	96	83	67	56	46	32	11	4	99	82	69	62	51	26	12	0
Valdez	17–21	98	65	24	9	3	1	0	0	99	59	36	20	5	1	0	0
Wiseman	14–17	90	67	49	39	29	14	2	1	98	69	58	51	36	12	3	1
Wrangell	19–23	94	50	8	3	1	0	0	0	91	31	11	5	1	0	0	0
Yakutat	15–18	99	60	10	2	1	0	0	0	97	44	17	7	2	0	0	0

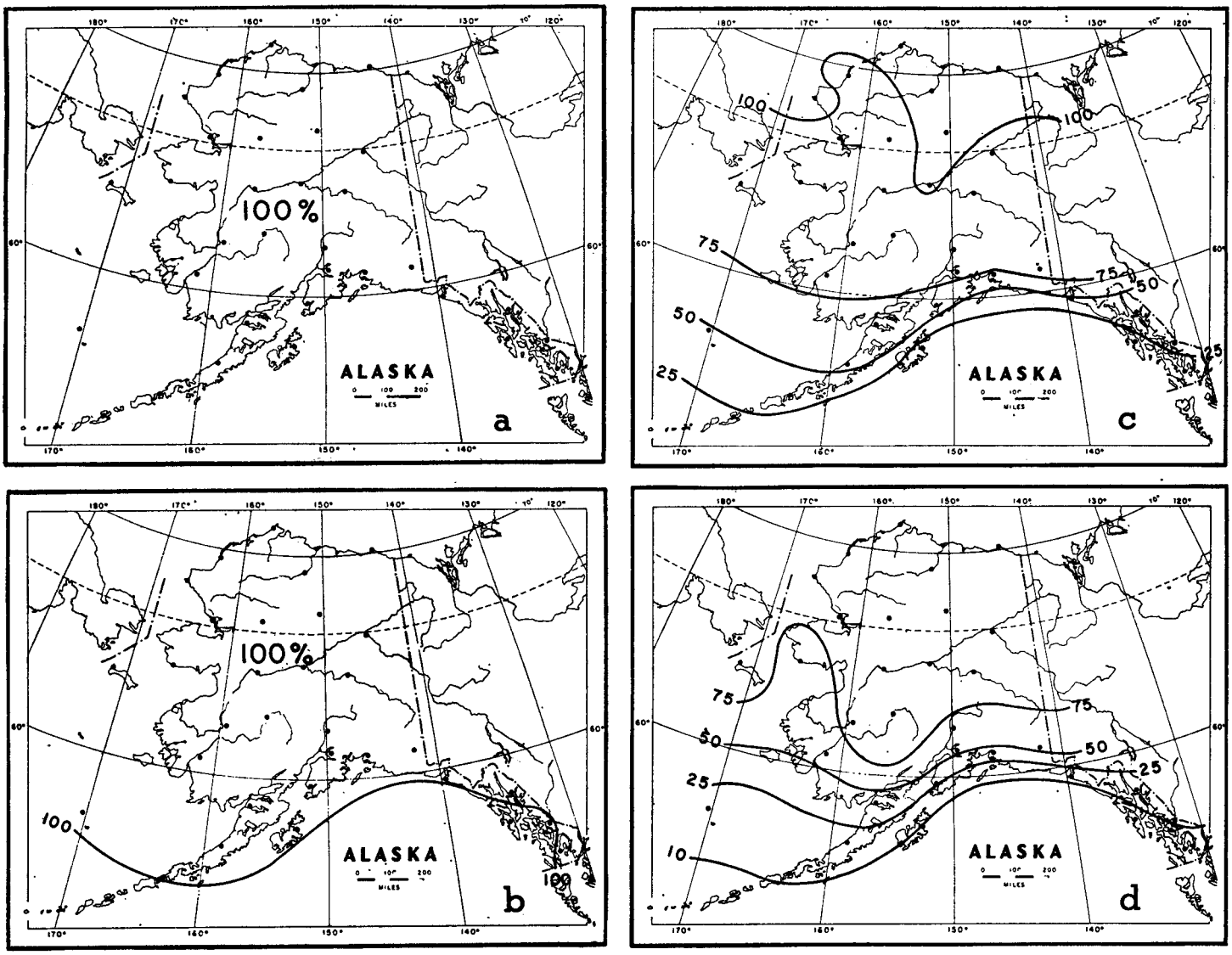

FIGURE 2.—Frequency (percent) of daily maximum temperature during January. (a) At or below 68° F.; (b) At or below 50° F.; (c) At or below 32° F.; (d) At or below 23° F.

3. MEAN TEMPERATURES

Because of its geographical position and rugged terrain, this region is subject to a variety of temperature regimes which are further influenced locally by elevation and exposure. In the interior, temperatures are often controlled by air drainage; near coasts they are more moderate due to proximity of water. Table 1 lists the mean, mean maximum, and mean minimum temperatures for January and July.

January is the coldest month at most stations. During this month mean temperatures range from −21.6° F. at Umiat on the north slope of the Brooks Range to 33.3° F. at Ketchikan on the southeast coast. Maritime influence is evidenced at Ketchikan where the difference between January and July mean temperatures is only 24.3° F. as compared to a difference of 75.1° F. at Umiat. At Fort Yukon, in interior Alaska, this difference is 82.2° F. In July, the warmest month at a majority of the stations (August is warmest at maritime stations), mean temperatures vary from 39.1° F. at Barter Island to 61.4° F. at Fort Yukon.

In the Panhandle exposed coastal stations are maritime in nature whereas temperatures of the inner parts of the islands and the mainland are influenced by their interior location. Mean temperatures in January vary approximately 5° F. (Juneau, 27.8° F. to Ketchikan 33.3° F.), stations on the coasts being warmer than those farther inland. Mean maximum temperatures in the southeastern area range from 31.8° F. (Juneau) to 39.1° F. (Ketchikan) in January and from 61.3° F. (Sitka) to 66.0° F. (Wrangell) in July. Mean minimum temperatures in January and July range from 24.4° F. to 29.7° F. (Juneau and Ketchikan) and from 47.7° F. to 50.1° F. (Yakutat and Ketchikan), respectively.

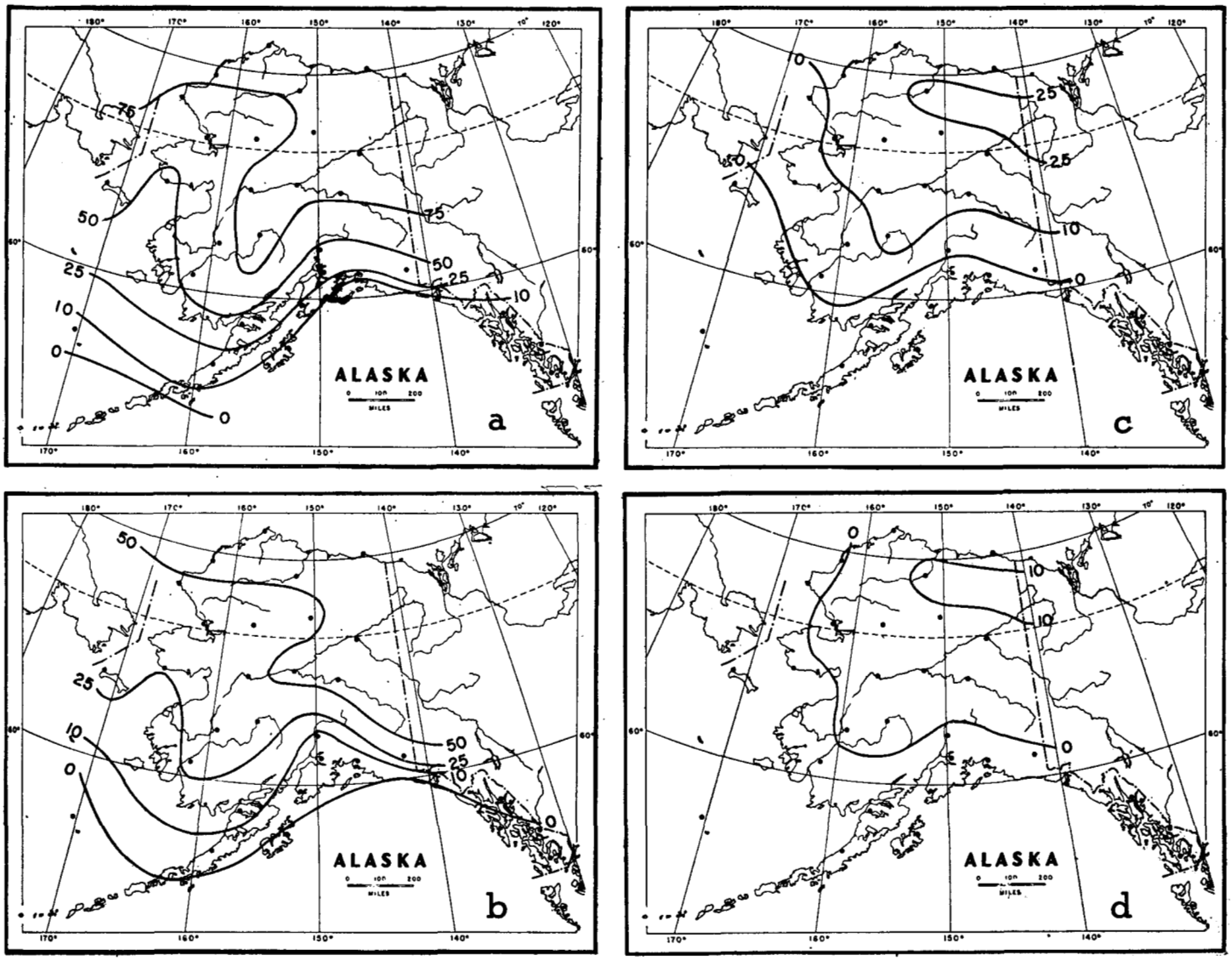

FIGURE 3.—Frequency (percent) of daily maximum temperature during January. (a) At or below 14° F.; (b) At or below 0° F.; (c) At or below −25° F.; (d) At or below −40° F.

Temperatures are generally mild on the outer coasts bordering the Gulf of Alaska and on the Alaska Peninsula. January mean temperatures range from 23.1° F. at Homer to 31.9° F. at Dutch Harbor. Farther inland it is colder; means in January range from 4.8° F. at Kennicott to 19.2° F. at Valdez. In July, mean temperatures vary from 49.0° F. at Cold Bay to 57.0° F. at Anchorage, the inner coastal stations being slightly warmer than stations more exposed to the effects of the ocean. Mean maximum temperatures in January are generally 10° F. to 25° F. higher at coastal stations than at stations in the interior, ranging from 12.8° F. (Kennicott) to 36.7° F. (Dutch Harbor). In July, the temperature progression is reversed, with mean temperatures at inland stations approximately 10° F. warmer than at well-exposed coastal stations. Mean maximum temperatures in July range from 54.0° F. at Cold Bay to 65.1° F. at Anchorage; mean minimum temperatures in this coastal region range from −3.2° F. at Kennicott to 27.8° F. at Dutch Harbor in January and from 40.4° F. at Kennicott to 48.9° F. at Anchorage in July.

Mean temperatures in January at coastal stations south of the Seward Peninsula have a range of about 11° F. Naknek, the southernmost station, has a mean temperature in January of 14.5° F. During this month mean temperatures decrease toward the north, becoming 3.4° F. at Nome on the southern coast of the Seward Peninsula. North of the Peninsula, mean January temperatures vary from −9.6° F. at Kotzebue to −16.7° F. at Barrow. Mean temperatures in July range from 39.1° F. at Barter Island to 54.9° F. at Naknek. Mean maximum temperatures are lowest along the Bering Sea coast in January and vary from −10.5° F. at Barrow to 21.9° F. at Naknek. In January, mean minimum temperatures range from 7.7° F. at Naknek to −23.3° F. at Barrow. In July, mean maximum temperatures range from 43.2° F. at

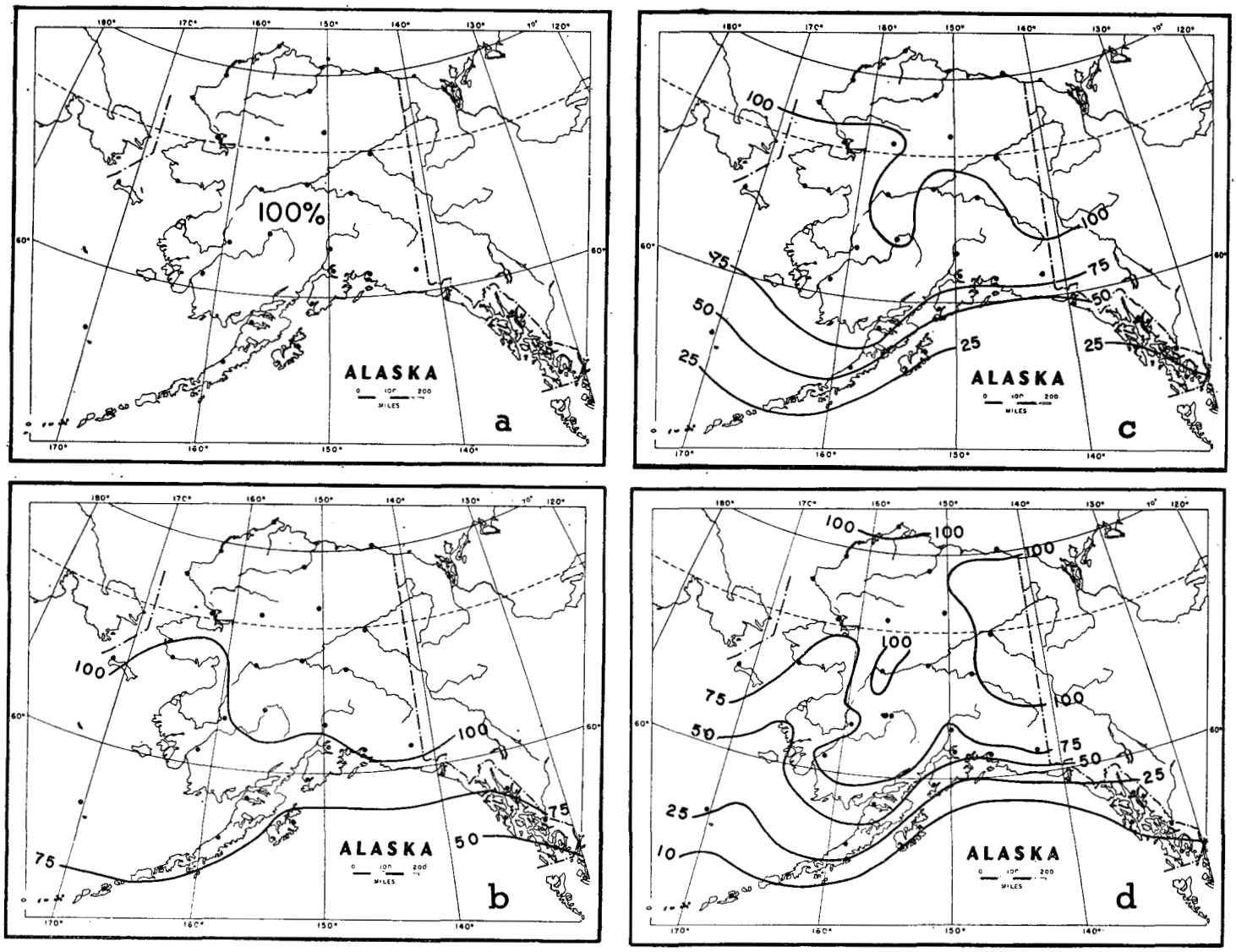

FIGURE 4.—Frequency (percent) of daily minimum temperature during January. (a) At or below 50° F.; (b) At or below 32° F.; (c) At or below 23° F.; (d) At or below 14° F.

Barter Island to a high of 63.2° F. at Naknek. Mean minimum temperatures vary from 33.7° F. at Barrow to 47.0° F. at Naknek.

Interior Alaska has, for the most part, a continental type climate. The influence of the Gulf of Alaska is rarely felt, because the mountains to the south and the Brooks Range in the north serve as barriers to maritime influence. During winter, when the Bering Sea is frozen, its influence is at a minimum; in summer, however, its effects are evidenced for considerable distances inland. Between the Alaska Range to the south and the Brooks Range to the north, mean temperatures in January vary from −0.5° F. at Holy Cross to −20.8° F. at Fort Yukon. Umiat, the only inland station north of the Brooks Range for which data are available, has a slightly lower January mean temperature, −21.6° F. In July, mean temperatures in the deep interior are considerably higher than at stations near the coast. Fort Yukon has the highest mean July temperature, 61.4° F., of all stations. Mean maximum temperatures in January range from 10.0° F. at Holy Cross to −10.9° F. at Fort Yukon. At Umiat the mean maximum temperature in January is −12.4° F. July mean maximum temperatures at interior stations vary from 67.0° F. at Holy Cross to 72.2° F. at Fort Yukon, the highest of all stations.

Mean minimum temperatures in January vary from −30.8° F. at Umiat to −5.1° F. at Holy Cross. July daily mean minimum temperatures vary from 43.1° F. at Umiat to 51.8° F. at Galena.

4. FREQUENCY OF OCCURRENCE OF SELECTED TEMPERATURES

Tables 2, 3, and 4 show for January, July, and for the year, the percentage frequency of daily maximum and daily minimum temperatures at or below the following

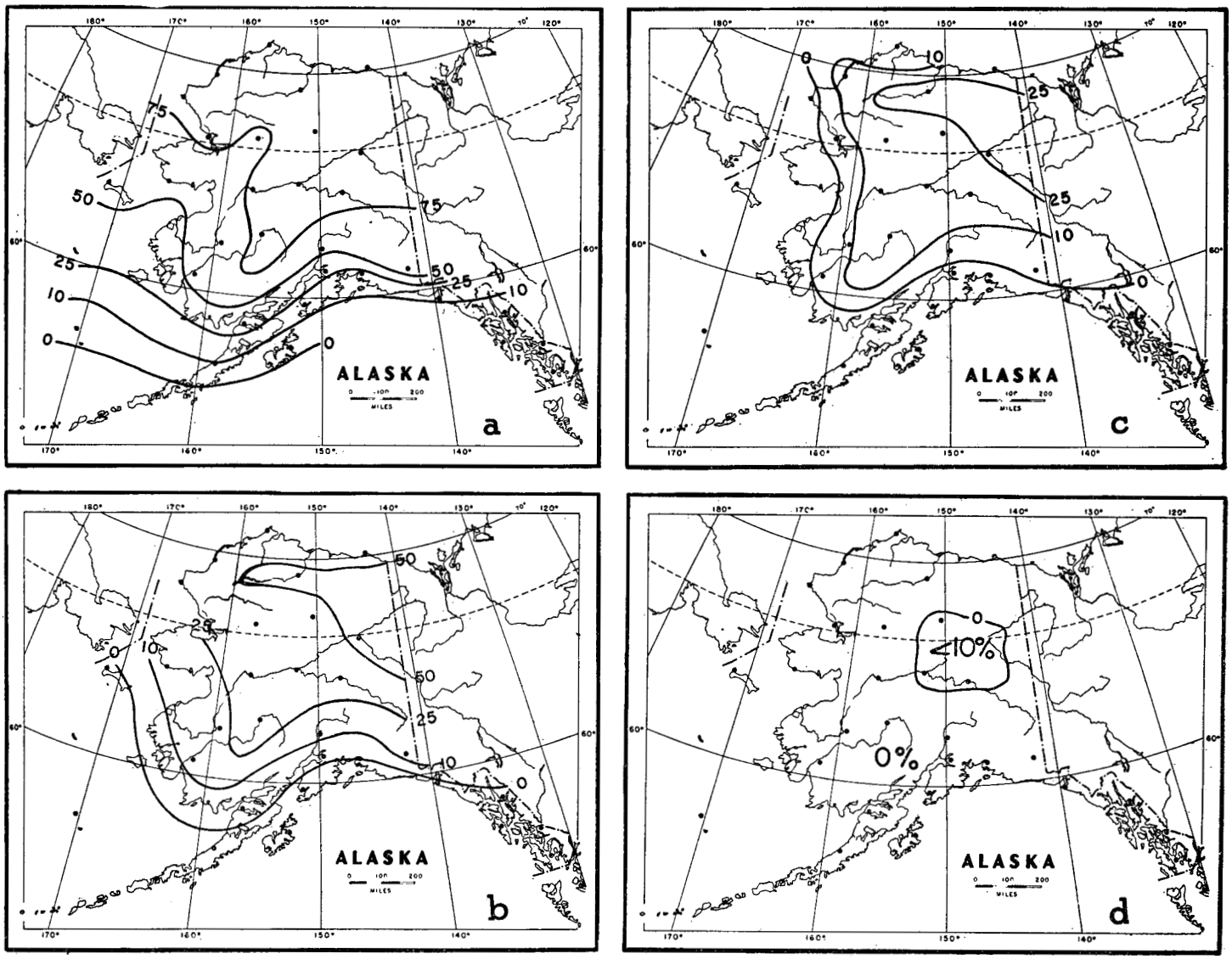

FIGURE 5.—Frequency (percent) of daily minimum temperature during January. (a) At or below 0° F.; (b) At or below −25° F.; (c) At or below −40° F.; (d) At or below −65° F.

selected values (° F.): 68, 50, 32, 23, 14, 0, −25, −40, and −65. Daily maximum temperatures at or below −65° F. and daily minimum temperatures at or below 68° F. are not included since the frequencies are 0 percent and 100 percent, respectively, at all stations in every month. Use of the tables provides detailed information of maximum and/or minimum temperature expectancies. These are of greater value and have wider application than previously discussed mean values. Data contained in tables 2 and 4 are presented graphically in figures 2 through 9. The temperature values used in this study, with the exception of 0° F., are specifically mentioned in military regulations and standards which govern the design, use, and storage of military items or are related to the issue and use of items of clothing and personal equipment.

The frequency of occurrence of maximum and minimum temperatures in the above ranges varies considerably depending to a large extent on the climatic influences at any one station.

Isolines of frequencies of daily maximum temperatures during January for each of the temperature values, are shown on maps, figures 2 and 3, and daily minimum temperatures for the same month are presented in figures 4 and 5. The annual frequencies of daily maximum and minimum temperatures for each of the values selected are presented in figures 6 through 9.

5. WINTER (JANUARY) FREQUENCIES

In January, interior and northern coastal stations are much colder than those of the southern coast, especially the Panhandle and Alaska Peninsula. Daily maximum temperatures of 32° F. or below occur only 16 percent of the time at Ketchikan and 18 percent of the time at Sitka, but occur 100 percent of the time at Barrow, Barter

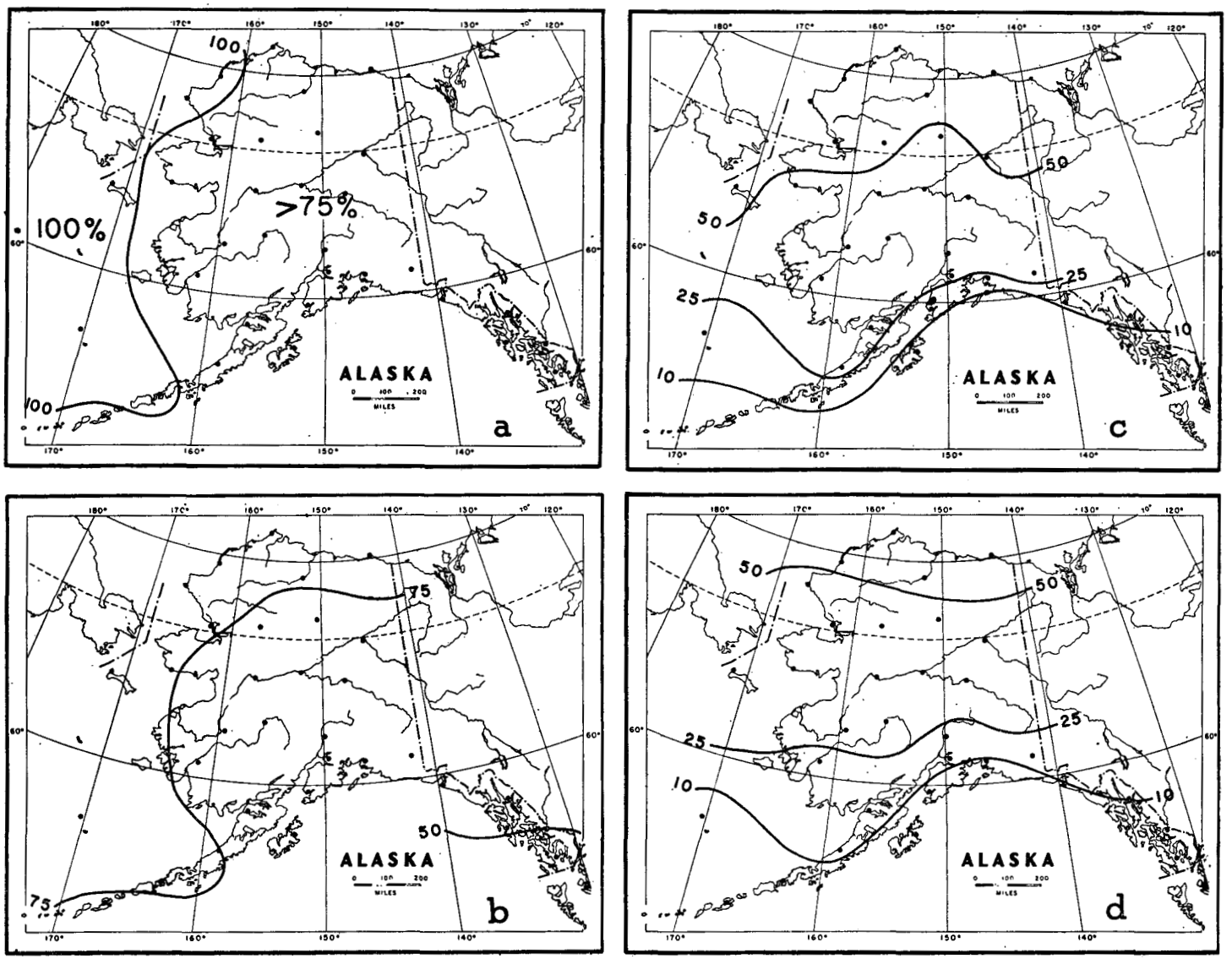

FIGURE 6.—Annual frequency (percent) of daily maximum temperature. (a) At or below 68° F.; (b) At or below 50° F.; (c) At or below 32° F.; (d) At or below 23° F.

Island, Point Hope, Tanana, Umiat, and Wiseman (fig. 2c). They may be expected over 90 percent of the time in central and northern Alaska, and even more southern stations, such as Anchorage, Bethel, Talkeetna, and Kennicott show occurrences of almost 80 percent or more.

One-third of the stations show significant frequencies (over 10 percent) of daily maximum temperatures at or below −25° F. (fig. 3c). Kotzebue and McGrath have 11 and 12 percent, respectively, while Umiat with the greatest frequency, has 39 percent (table 2). Daily maximum temperatures at or below −40° F. occur at only 12 of the stations (fig. 3b). The greatest frequencies occur at Umiat, 15 percent; Galena, 10 percent; and Fort Yukon, 9 percent. Several stations, including Barrow, Holy Cross, and Kotzebue, have frequencies of less than 1 percent.

Daily minimum temperatures at or below 32° F. occur over 50 percent of the time at all stations (fig. 4b), and over 80 percent of the time at all but 7 stations (table 2). Ketchikan, with 50 percent has the smallest percentage, and 17 of the stations have frequencies of 100 percent. Minimum temperature frequencies at or below −25° F. vary from 0 percent at Panhandle, Peninsula, southern Alaska, and island stations to a maximum frequency of 65 percent at Umiat (fig. 5b and table 2). Slightly more than one-third of the stations have frequencies of 25 percent or more during this month.

Significant frequencies of daily minimum temperatures at or below −40° F. are limited to stations in the interior, northern slope, and Arctic coast (fig. 5c). Umiat has the greatest frequency, 33 percent, and Fort Yukon, Galena, and McGrath have frequencies of over 20 percent. Daily minima at or below −65° F. are found at only 4 stations:

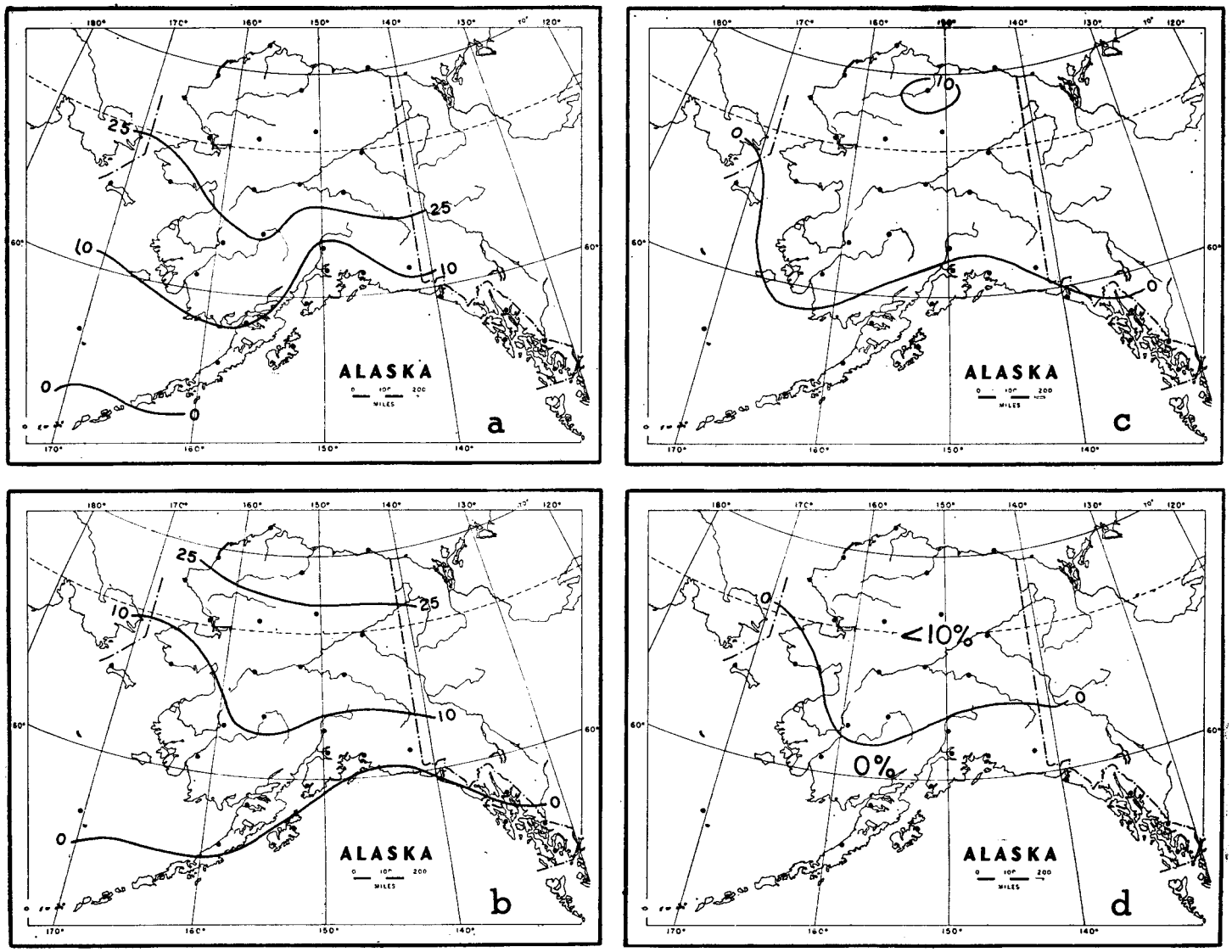

FIGURE 7.—Annual frequency (percent) of daily maximum temperature. (a) At or below 14° F.; (b) At or below 0° F.; (c) At or below −25° F.; (d) At or below −40° F.

Fort Yukon, 2 percent; Tanana, 1 percent; and Fairbanks and Wiseman, each having less than 1 percent (table 2 and fig. 5d).

6. SUMMER (JULY) FREQUENCIES

During July, daily maximum temperatures at or below 68° F. occur on 13 percent of the days at Fort Yukon and 31 percent of the days at Fairbanks, as compared to 100 percent of the days at coastal and island stations such as Barter Island, Point Hope, Gambell Island, and St. Paul Island (table 3). The latter stations have a greater percentage of temperatures below this value due to their maritime exposure. Inland stations, not subjected to oceanic influence, experience a greater percentage of temperatures above 68° F. Daily maximum temperatures at or below freezing occur only at Barter Island, 1 percent, and Barrow, with a frequency of less than 1 percent. In general, daily maximum temperatures are at or above 50° F. most of the time except at coastal and island stations of western and northern Alaska. At these stations, daily maximum temperatures are at or below 50° F. at least 14 percent of the time at Kotzebue and 82 percent of the time at Barter Island.

As mentioned above, daily minimum temperatures during July are less than 68° F. at all stations. They are less than 50° F. over 75 percent of the time except in central Alaska and the southern part of the Panhandle. Galena records only 29 percent and Holy Cross and Tanana 71 and 70 percent, respectively (table 3). This difference may be attributed to the short period of record (7 years) at Galena. In the Panhandle, a daily minimum at or below 50° F. varies from a frequency of 41 percent at Ketchikan to 64 and 65 percent, respectively, at Sitka and Juneau (table 3).

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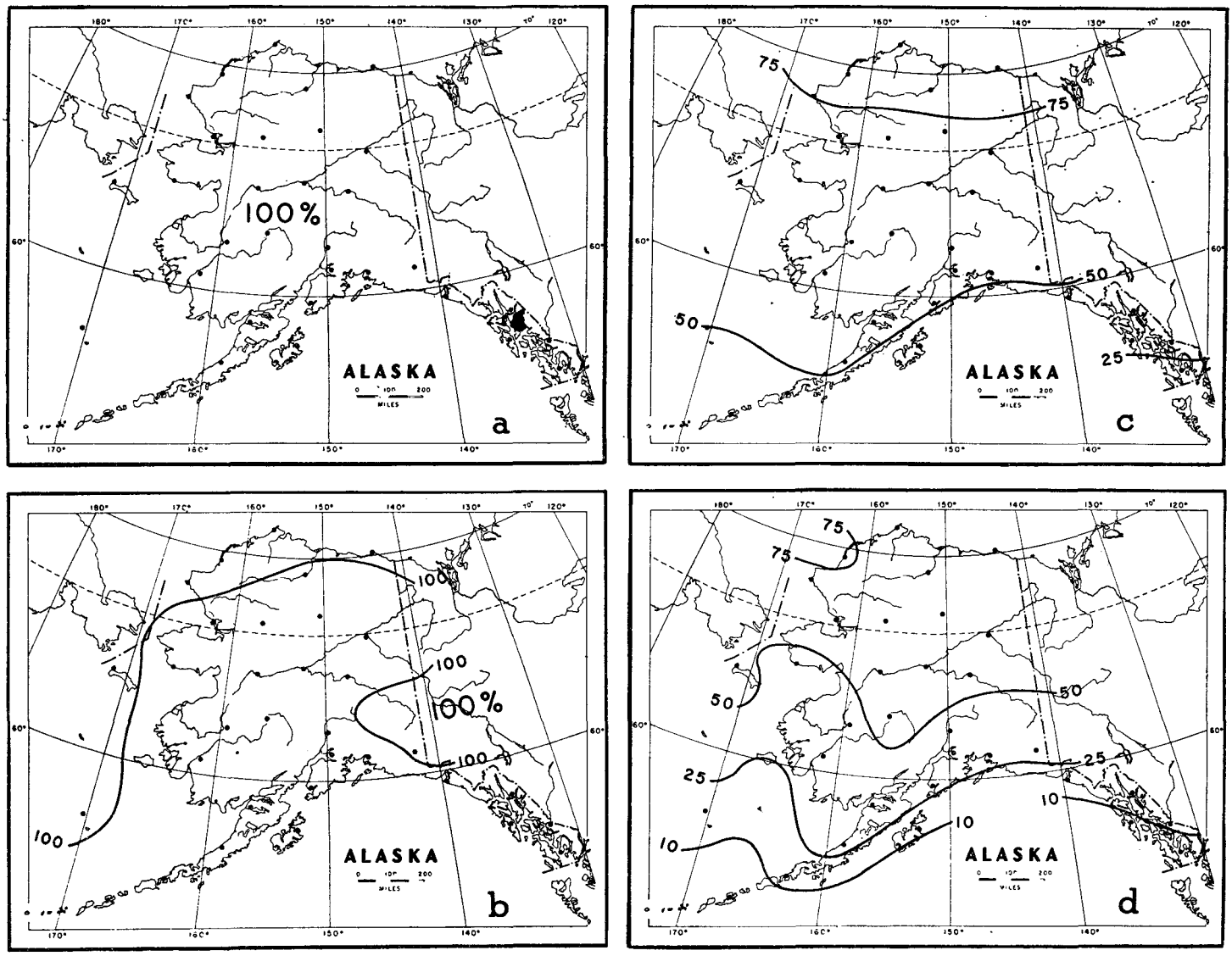

FIGURE 8.—Annual frequency (percent) of daily minimum temperature. (a) At or below 68° F.; (b) At or below 50° F.; (c) At or below 32° F.; (d) At or below 23° F.

Daily minimum temperatures below freezing in July are rare at all stations south of the Brooks Range. North of the Brooks Range, Point Hope and Point Lay have frequencies of 8 and 10 percent, respectively, while Barter Island and Barrow, with 39 and 41 percent, respectively, have the greatest occurrence. Temperatures below 0° F. do not occur at any of the stations during this month.

7. ANNUAL FREQUENCIES

Table 4 and figures 6 through 9 present information of the annual frequency of occurrence of the selected temperature values. This table, and the maps, show the average frequency of occurrence of each value during the entire year.

Daily maxima at or below 68° F. (fig. 6a) occur more than 90 percent of the time at all but four of the stations (Fairbanks, Fort Yukon, Talkeetna, and Tanana), and frequencies of maxima at or below freezing (fig. 6c) range from 4 percent at Ketchikan and Sitka in the Panhandle to 73 and 74 percent, respectively, at Barter Island and Point Lay in the extreme north. Daily maxima at or below −25° F. (fig. 7c) occur most frequently at Umiat, 11 percent, Barter Island, 7 percent, and Fort Yukon, 6 percent. Daily maxima at or below −40° F. occur at 13 of the stations (fig. 7d). Umiat has the greatest frequency with 4 percent.

Daily minimum temperatures at or below freezing (fig. 8c) occur 20 percent of the time at Ketchikan and 89 percent of the time at Barrow. In general, stations in southern Alaska have minimum temperatures at or below 32° F. for 20 to nearly 60 percent of the time, those in central Alaska, for 50 to 75 percent of the time, and north of the Brooks Range, over 75 percent of the time.

Daily minimum temperatures at or below −25° F.

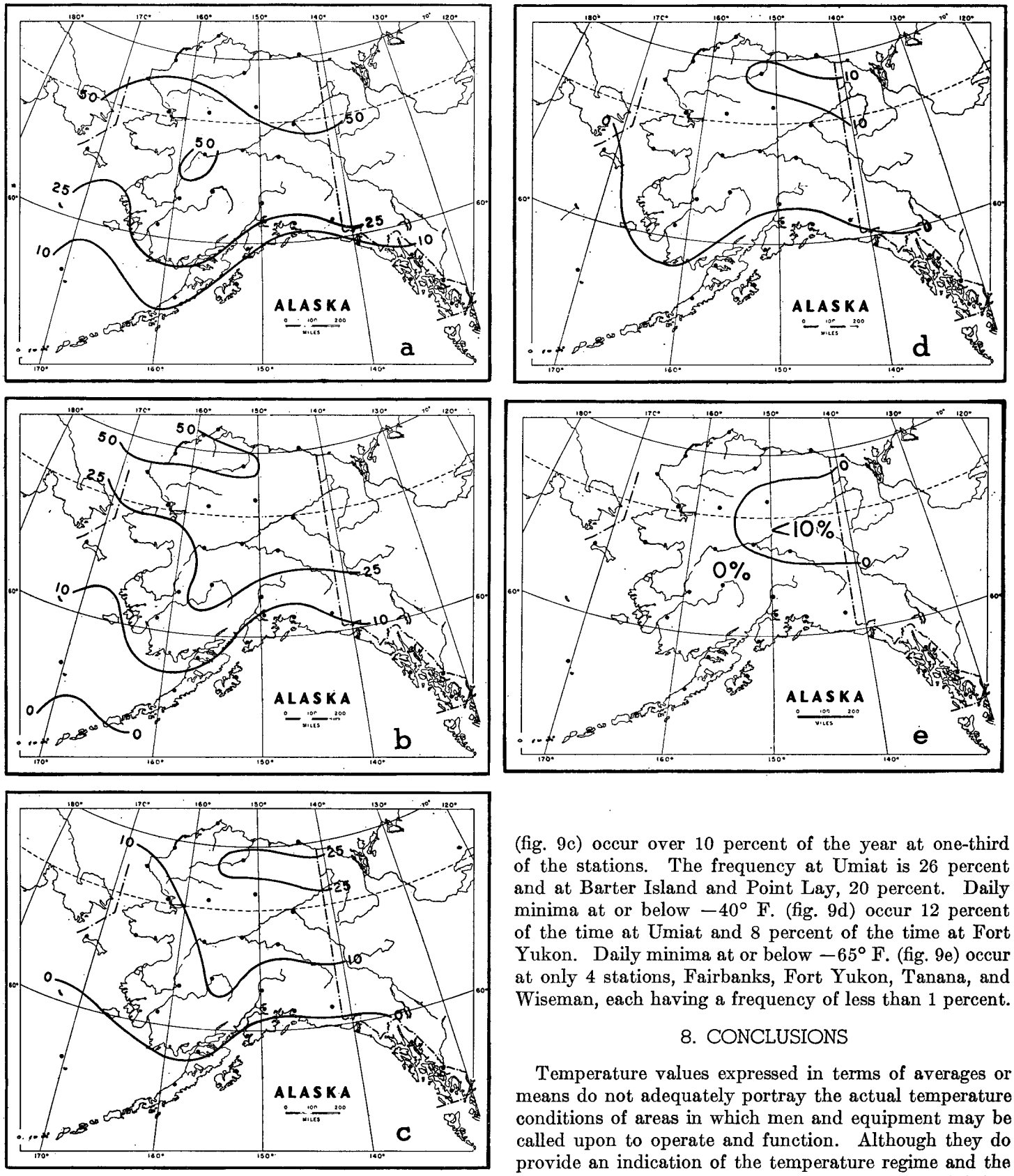

FIGURE 9.—Annual frequency (percent) of daily minimum temperature. (a) At or below 14° F.; (b) At or below 0° F.; (c) At or below −25° F.; (d) At or below −40° F.; (e) At or below −65° F.

(fig. 9c) occur over 10 percent of the year at one-third of the stations. The frequency at Umiat is 26 percent and at Barter Island and Point Lay, 20 percent. Daily minima at or below −40° F. (fig. 9d) occur 12 percent of the time at Umiat and 8 percent of the time at Fort Yukon. Daily minima at or below −65° F. (fig. 9e) occur at only 4 stations, Fairbanks, Fort Yukon, Tanana, and Wiseman, each having a frequency of less than 1 percent.

8. CONCLUSIONS

Temperature values expressed in terms of averages or means do not adequately portray the actual temperature conditions of areas in which men and equipment may be called upon to operate and function. Although they do provide an indication of the temperature regime and the severity of the climate they do not provide as much information as do tabulations of frequencies of selected temperatures. The frequency of occurrence of critical tem-

peratures in the Arctic and sub-Arctic is of major importance to military activities due to the variability of temperatures in such areas and the stress imposed on men and equipment by extreme cold.

9. ACKNOWLEDGMENTS

Appreciation is expressed to Sir Hubert Wilkins for his review of this paper and his many helpful suggestions; to Miss Elizabeth Mason, Chief, Cartographic Section, Mrs. Odette Taft and Miss Gertrude Barry for preparing maps; and to Mr. Owen S. Parmele for assisting in compiling the data.

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